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TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Application Number	09/651,421
Filing Date	08/30/2000
First Named Inventor	Dale Buermann
Group Art Unit	2877
Examiner Name	Richard A. Rosenberger
Attorney Docket Number	NAK-120
Total Number of Pages in This Submission	

ENCLOSURES *(check all that apply)*

- [x] Fee Transmittal Form
  - [x] Fee Attached
- [ ] Amendment / Reply
  - [ ] After Final
  - [ ] Affidavits/declaration(s)
- [ ] Extension of Time Request
- [ ] Express Abandonment Request
- [ ] Information Disclosure Statement
- [ ] Certified Copy of Priority Document(s)
- [ ] Response to Missing Parts/ Incomplete Application
  - [ ] Response to Missing Parts under 37 CFR 1.52 or 1.53
- [ ] Assignment Papers *(for an Application)*
- [ ] Drawing(s)
- [ ] Licensing-related Papers
- [ ] Petition
- [ ] Petition to Convert to a Provisional Application
- [ ] Power of Attorney, Revocation Change of Correspondence Address
- [ ] Terminal Disclaimer
- [ ] Request for Refund
- [ ] CD, Number of CD(s) ______
- [ ] After Allowance Communication to Group
- [ ] Appeal Communication to Board of Appeals and Interferences
- [x] Appeal Communication to Group (*Appeal Notice, Brief, Reply Brief*)
- [ ] Proprietary Information
- [ ] Status Letter
- [ ] Other Enclosure(s) *(please identify below)*:

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Remarks

3 copies of Appeal Brief

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Firm *or* Individual name	Tianhua Gu, Reg. No. 52480
Signature	Tianhua Gu
Date	8/13/03

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FEE TRANSMITTAL for FY 2003

Effective 01/01/2003. Patent fees are subject to annual revision.

☑ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT ($) 885

Complete if Known	
Application Number	09/651,421
Filing Date	08/30/2000
First Named Inventor	Dale Buermann
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Art Unit	2877
Attorney Docket No.	NAK-120

METHOD OF PAYMENT *(check all that apply)*

☐ Check ☑ Credit card ☐ Money Order ☐ Other ☐ None

☐ Deposit Account:

Deposit Account Number:

Deposit Account Name:

The Commissioner is authorized to: *(check all that apply)*

☐ Charge fee(s) indicated below ☐ Credit any overpayments

☐ Charge any additional fee(s) during the pendency of this application

☐ Charge fee(s) indicated below, **except for the filing fee**

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FEE CALCULATION

1. BASIC FILING FEE

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1001	750	2001	375	Utility filing fee	
1002	330	2002	165	Design filing fee	
1003	520	2003	260	Plant filing fee	
1004	750	2004	375	Reissue filing fee	
1005	160	2005	80	Provisional filing fee	

SUBTOTAL (1) ($)

2. EXTRA CLAIM FEES FOR UTILITY AND REISSUE

		Extra Claims		Fee from below		Fee Paid
Total Claims	-20** =		X		=	
Independent Claims	- 3** =		X		=	
Multiple Dependent					=	

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
1202	18	2202	9	Claims in excess of 20
1201	84	2201	42	Independent claims in excess of 3
1203	280	2203	140	Multiple dependent claim, if not paid
1204	84	2204	42	** Reissue independent claims over original patent
1205	18	2205	9	** Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) ($)

***or number previously paid, if greater; For Reissues, see above*

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1051	130	2051	65	Surcharge - late filing fee or oath	
1052	50	2052	25	Surcharge - late provisional filing fee or cover sheet	
1053	130	1053	130	Non-English specification	
1812	2,520	1812	2,520	For filing a request for *ex parte* reexamination	
1804	920*	1804	920*	Requesting publication of SIR prior to Examiner action	
1805	1,840*	1805	1,840*	Requesting publication of SIR after Examiner action	
1251	110	2251	55	Extension for reply within first month	
1252	410	2252	205	Extension for reply within second month	
1253	930	2253	465	Extension for reply within third month	
1254	1,450	2254	725	Extension for reply within fourth month	725
1255	1,970	2255	985	Extension for reply within fifth month	
1401	320	2401	160	Notice of Appeal	
1402	320	2402	160	Filing a brief in support of an appeal	160
1403	280	2403	140	Request for oral hearing	
1451	1,510	1451	1,510	Petition to institute a public use proceeding	
1452	110	2452	55	Petition to revive - unavoidable	
1453	1,300	2453	650	Petition to revive - unintentional	
1501	1,300	2501	650	Utility issue fee (or reissue)	
1502	470	2502	235	Design issue fee	
1503	630	2503	315	Plant issue fee	
1460	130	1460	130	Petitions to the Commissioner	
1807	50	1807	50	Processing fee under 37 CFR 1.17(q)	
1806	180	1806	180	Submission of Information Disclosure Stmt	
8021	40	8021	40	Recording each patent assignment per property (times number of properties)	
1809	750	2809	375	Filing a submission after final rejection (37 CFR 1.129(a))	
1810	750	2810	375	For each additional invention to be examined (37 CFR 1.129(b))	
1801	750	2801	375	Request for Continued Examination (RCE)	
1802	900	1802	900	Request for expedited examination of a design application	

Other fee (specify)____________________

*Reduced by Basic Filing Fee Paid

SUBTOTAL (3) ($) 885

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Signature	Tianhua Gu			Date 8/13/03

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08/19/2003 HVUONG1 00000149 09651421
02 FC:2254 725.00 OP

IN THE US PATENT AND TRADEMARK OFFICE

In re Application of:

Dale Buermann

Serial No: 09/651,421

Filed: 08/30/2000

Art Unit: 2877

Examiner: Richard A. Rosenberger

For: SIMULTANEOUS COMPENSATION OF SOURCE AND DETECTOR DRIFT IN OPTICAL SYSTEMS

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Date of deposit

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AGA KLESZCZ

Name of Person Signing

APPEAL BRIEF

REAL PARTY IN INTEREST

The subject invention is owned by n&k Technology, Inc. of Santa Clara, California.

RELATED APPEALS AND INTERFERENCES

There are no related Appeals and Interferences.

STATUS OF CLAIMS

On April 11, 2003, Appellant appealed against the final rejections of claims 1, 3 and 5 – 25. Claims 1, 8, have been once amended in a reply submitted December 20, 2002 responding to an Office Action mailed June 21, 2002.

STATUS OF AMENDMENTS

The latest amendments were presented in the reply submitted December 20, 2002 based on which a final Office Action was mailed on January 13, 2003.

SUMMARY OF THE INVENTION

The invention is a method and system for simultaneously compensating a source drift of a light source and a detector drift of a light detector in a light detector. The simultaneous compensation is accomplished with a tested sample remaining in position relative to an operational beam path. The preferred sample is a wafer the surface of which is examined by the inventive method and system in a well-known spectroscopic fashion. Such spectroscopic surface measurements require careful and time-consuming positioning of the sample at the test location prior to measurement. Providing for drift compensation while the sample remains at the test location is hence substantial for improving the spectroscopic examination process.

As is well-known in the art, an optimized calibration of a light detector is accomplished by adhering as close as possible to the operational conditions during the calibration process. Following this well-known prerequisite, the present invention utilized a calibration sample that is placed at the test location prior to positioning and testing of the sample. During the calibration process, a light beam is generated by the light source, directed along the operational optical path to impinge the calibration sample, which has well-known reflective properties. A response beam generated from the calibration sample continues along the remainder of the operational optical path and impinges the light detector, which in turn generates an electrical detection signal from the received optical response beam. The detection signal obtained during the calibration process is a resemblance of the calibration sample's known reflectivity together with the systems condition. During the calibration, light source and detector are calibrated such that the distorting effect of the systems condition is minimized with respect to the detection signal. After calibration, the detection signal closely matches the known reflectivity of the calibration sample. In the exemplary graph of Fig. 2,

the curve indicated **C.S**. depicts a simplified detection signal resembling the reflectivity of a calibration sample in the range between 120 & 2000nm.

Once the test sample is in position, the test location is occupied and inaccessible for the calibration sample and the operational beam path is consequently not available for calibration purposes. To provide light source and detector drift compensation while the test sample remains in test position, the present invention utilizes a beam path crossing and a reference sample that may be placed at the beam path crossing in response to a drift of the light source and/or the detector. The reference sample is placed, such that the incident beam propagating away from the light source is reflected by the reference sample towards the detector along the remainder of the operational beam path. Placing the reference sample at the beam crossing provides for a second beam path that bypasses the test location such that a distinct reference beam may be directed onto the detector. Even though the test location remains occupied, the reference beam is unaffected by the test samples reflectivity.

The second beam path is basically a shortcut from the light source via the reference sample to the detector with only a portion of the first operational beam path's optical elements. As an unavoidable side effect, the reference beam passes through a lesser number of optical elements than the response beam does. This is an important fact that limits a direct substitution of the calibration sample at the beam crossing since it would produce different detection signals for identical light source and detector settings. In the exemplary graph of Fig. 2, the curve indicated **R.S**. depicts a simplified detection signal resembling the reflectivity of a reference sample in the range between 120 & 2000nm.

In the present invention the unavoidable side effect of differing degrading properties of the first operational beam path and the second beam path is accounted for by establishing a

relation between the response signal and the reference signal first. This relation is established following the calibration process and prior to sample testing. In the exemplary graph of Fig. 2, the established relation is shown as **ΔR** value. The established relation is processed in conjunction with the detection signal derived from the reference beam to perform a relative calibration for a drift of the light source and/or the detector while the test sample remains in test position. Due to the use of the established relation, the relative calibration may substitute the absolute calibration performed by use of the actual calibration sample at the test location.

To keep the calibration effort to a minimum, it is desirable to perform recalibration only when it becomes necessary. For that purpose, the present invention provides for well-known operational calibration parameters such a set time period or known conditions causing drift of light source and/or detector. A control unit monitors the system during sample testing and initiates the relative calibration when operational calibration parameters are recognized.

The inventive combination of absolute calibration and relative calibration in combination with an established relation enables the studying of the reflectivity characteristics of optical components involved along the operational beam path. Also, calibration sample and reference sample may be selected with distinct reflectivity characteristics for a more pronounced **ΔR** value. The calibration sample may preferably match closely the actual tested sample, which may be a silicon wafer with an approximate 50% reflectivity between 120 and 2000nm. A quartz may be selected as reference sample with a nearly 100% reflectivity over this wavelength range.

ISSUES

In the first Office Action mailed June/21/2002, the Examiner rejected all claims in accordance with 35 U.S.C. 103(a) based on cited references Frohardt et al (US 4,830,504) and Wulf et al (US 5,028,800) taken together in view of Piwonka-Corle et al (US 5,910,842).

In the reply, the Applicant has amended the independent claims 1 and 8 to more specifically claim their invention. Specifically, the Applicants have added the following limitations in the independent method claim 1:

1. a beam path crossing (excerpt of claim 1a);
2. a temporary placing of a reference sample (excerpt of claim 1e);
3. establishing an relation between said known response beam and said reference beam (claim 1f);
4. defining a group of operational calibration parameters including a set time period, drift of said light source of drift or drift of said light detector (claim 1g);
5. interrupting said testing in conjunction with said operational calibration parameters and temporarily placing said reference sample at said beam crossing for simultaneously compensating said source drift and said detector drift using said established relation while said test sample remains in position (claim 1i).

The Applicant has further amended the independent system claim 8 to include the following limitations:

6. the second beam path being substantial part of the first beam path (excerpt of claim 8d);
7. wherein said reference sample is configured for being placed in response to at least one of a group of operational calibration parameters including a set time period, drift of said light source of drift of said light detector (excerpt of claim 8g);

8. using <u>a established relation between said known response beam and said reference beam</u> (excerpt of claim 8h);

Following the first reply, the Examiner issued a final Office Action, which was mailed January, 13, 2003. The arguments and wording in the final Office Action are identical to those of the previous Office Action except on page two second line from bottom where the term "reference sample" is replacing the term "reflector" of the first Office Action and one additional sentence beginning page 3, line 4, where it reads: "The reference sample of Wulf et al is placed in the path while the test sample remains in position, and is interposed at the crossing point at a fixed time period".

No references were found in the final Office Action to the limitations newly added in the previous reply except those relating to the sample remain in test position (part of limitation 5) and those relating to set time period (part of limitation 4 and 7).

Specifically, the established relation between known response beam and reference beam as an important element to make the invention operative has not been addressed by the Examiner.

GROUPING OF CLAIMS

The Appellant believes that claims 1 – 25 stand or fall together. Arguments in support of the above defined group are presented in the below.

THE EXAMINER'S RATIONALE

Regarding the final Office Action, the Examiner's rationale for not considering the established relation between known response beam and reference beam may not be recognized by the Applicant due to lack of related arguments in the final Office Action.

In the Claims rejections of the first Office Action and the final Office Action, the Examiner rejects Claims 1 – 25 as being unpatentable over Frohardt et al (US 4,830,504) and Wulf et al (US 5,028,800), taken together, in view of Piwonka-Corle et al (US 5,910,842).

The Examiner rejecting arguments presented in the final Office Action may be listed as follows:

1. based on Frohardt, measuring the output of a light source to allow for compensation for beam intensity drift or the like;
2. based on Frohardt, to measure a reference and a sample in "the some position" to compensate for the changes in light source intensity and the calibration standard;
3. based on Wulf, obtaining a measure of the light source intensity in which "the light being direct to the sample position and from the sample position to cross, with a reference sample being positioned at the crossing point to measure intercept the light beam before it encounters the sample at direct to the detector;
4. placing a reference in the place of the sample of Wulf in the manner taught be Frohardt et al. The reference sample of Wulf et al is placed in the path while the test sample remains in position, and is interpose at the crossing point at a fixed time period;

5. based on Wulf and Piwonka, those in the art could choose appropriate mirrors and adjust the arrangement as convenient.

Text between quotation marks is written as printed in the Office Action since unambiguous interpretation is impaired by unclear orthography.

ARGUMENT

In context with rejecting argument 1, the Applicant respectfully holds that what is claimed is a simultaneous compensation of light source drift and light detector drift. To the contrary, in Frohardt et al the light source (25) is independently adjusted via the beamsplitter (58) and an additional sensor (56). Also an additional and separate beam path (60) is introduced for that purpose, which is not part of the measurement beam path. Drift of the sensor (56) remains undetected and may contribute to a misadjustment of the light source (25) and may result in inaccurate measurements of the apparatus as may be well appreciated by anybody skilled in the art.

In context with rejecting argument 2, the Applicant respectfully holds that the use of the calibration standard (44) cannot be utilized in combination with the sensor (56) to adjust drift in the sensor (56). In addition, drift adjustment of the sensor (30) is not possible while keeping the test sample in position. The entire apparatus needs to be moved away from test sample in order to bring the calibration standard (44) into calibration position and to perform a calibration of the sensor (30). In summary, the use of a separate sensor (50), which may not be calibrated by use of the calibration standard (44) and inability of the apparatus to calibrate the sensor (30) during an operational measurement of a test sample make Frohardt et al materially different from the Applicant's invention. The shortcomings of Frohardt et al may be clearly solved by the Applicant's invention where drift in light source and light detector are simultaneously compensated without removing the test sample from its test position. Hence, the Applicants hold that Frohardt et al in itself clearly supports non-obviousness of the

Applicant's invention. The Applicant has accordingly amended the independent Claims 1 and 8 in the first reply.

In context with rejecting argument 3, the Applicant holds that Wulf et al is in so far materially different from the Applicant's invention as Wulf teaches not a reference sample but a constantly rotating chopper placed in the beam path crossing. The chopper has two reflective sections circumferentially arranged in an alternating fashion together with two translucent sections. The chopper is permanently placed in the beam path to provide a frequent and predetermined switching between the test beam and the reference beam. Neither operational calibration parameters are taken into account nor is the chopper placed only temporarily during the calibration. The permanent presence of the rotating chopper represents an optical element that is crossed by the incident beam and by the reflected measurement beam and may degrade the measurement quality as is well-known in the art. The Applicant has accordingly amended the Claims 1 and 8 in the first reply.

In context with rejecting argument 4, the Applicant respectfully holds that a combination of Wulf et al and Frohardt et al would not render an operative apparatus most importantly due to the absence of an established relation between response beam and reference beam. It is the relation between response beam and reference beam that makes the Applicants invention operative. Nothing related to the established relation is taught in the cited references. It is further unclear how a calibration of the system may be accomplished since the rotating chopper introduces a total of four system conditions associated with each of the two reflective

and two translucent sections that are constantly and permanently moved across the beam path. Thus, neither absolute nor relative calibration may be accomplished at a precision level similar to that may be accomplished with the Applicant's invention.

Finally and in context with rejecting argument 5, the Applicant respectfully holds, that the Examiner cites Wulf's and Piwonka's teaching of used curved mirrors to focus and direct the light. This combination of Wulf et al, Frohardt et al and Piwonka-Corle would not render an apparatus as claimed in the application.

In summary and, in view of the above, the Applicant respectfully disagrees with the Examiner's rejection and believes that amended Claims **1** and **8** are unobvious..

SUMMARY

The Appellant has presented clear arguments traversing the Examiner's rejections and pointing out to the shortcomings in the final Office Action. The Appellant therefore respectfully requests a reversal of the Examiner's rejections of claims 1-25.

Respectfully submitted,

Johannes Schneeberger

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APPENDIX APPEALED CLAIMS

1. *(previously amended)* A method for simultaneously compensating a source drift of a light source and a detector drift of a light detector, said method comprising:
   a) providing a first beam path with a crossing for a probe beam traveling from said light source to said light detector along a test location;
   b) providing a second beam path from said light source to said light detector along said crossing and not along said test location;
   c) positioning at said test location a calibration sample for sending a known response beam along said first beam path to said light detector in response to said probe beam;
   d) calibrating said light source and said light detector using said known response beam;
   e) temporarily placing a reference sample at said beam crossing for sending a reference beam along said second beam path to said light detector in response to said probe beam;
   f) establishing a relation between said known response beam and said reference beam;
   g) defining a group of operational calibration parameters including a set time period, drift of said light source or drift of said light detector;
   h) positioning at said test location a test sample and testing said test sample;

   interrupting said testing in conjunction with said operational calibration parameters and temporarily placing said reference sample at said beam crossing for simultaneously compensating said source drift and said detector drift using said established relation while said test sample remains in position.

2. *(original)* The method of claim 1, wherein said step of simultaneously compensating comprises establishing a relation between said known response beam and said reference beam.

3 *(original)* The method of claim 1, further comprising placing a test sample at said test location such that said test sample sends a response beam along said second beam path to said light detector in response to said probe beam.

4. *(original)* The method of claim 3, wherein said step of placing said reference sample at said beam crossing and said step of simultaneously compensating are performed while said test sample is at said test location.

5. *(original)* The method of claim 1, wherein said calibration sample is a reflective calibration sample having a well-known reflectivity.

6. *(original)* The method of claim 1, wherein said reference sample is selected such that the intensity of said reference beam is within a predetermined range of the intensity of said response beam.

7. *(original)* The method of claim 1, further comprising the step of collimating said probe beam and said response beam at said beam crossing.

8. *(previously amended)* A system for simultaneously compensating a source drift of a light source and a detector drift of a light detector, said system comprising:

a) a test location;

b) a first beam path from said light source to said light detector along said test location;

c) a beam crossing along said first beam path;

d) a second beam path from said light source to said light detector along said beam crossing and not along said test location, said second beam path being substantially part of said first beam path;

e) a calibration sample for positioning at said test location and for sending a known response beam along said second beam path to said light detector in response to said probe beam;

f) a first control unit for calibrating said light source and said light detector using said

known response beam;

g) a reference sample for placing at said beam crossing for sending a reference beam along said second beam path to said light detector in response to said probe beam, wherein said reference sample is configured for being placed in response to at least one of a group of operational calibration parameters including a set time period, drift of said light source or drift of said light detector; and

a second control unit for simultaneously compensating said source drift and said detector drift using a established relation between said known response beam and said reference beam.

9. *(original)* The system of claim 8, further comprising a test sample for positioning at said test location for sending a response beam along said second beam path to said light detector in response to said probe beam.

10. *(original)* The system of claim 9, wherein said reference sample is selected such that the intensity of said reference beam is within a predetermined range of the intensity of said response beam.

11. *(original)* The system of claim 8, wherein said calibration sample is a silicon sample.

12. *(original)* The system of claim 8, wherein said light source is selected from the group of light sources consisting of incandescent bulbs, lasers, and gas discharge tubes.

13. *(original)* The system of claim 8, wherein said light source is a broadband light source.

14. *(original)* The system of claim 8, wherein said light detector is selected from the group of light detectors consisting of broadband light detectors and

photospectrometers.

15. *(original)* The system of claim 8, wherein said calibration sample is reflective calibration sample having a well-known reflectivity.

16. *(original)* The system of claim 8, further comprising a first toroidal mirror positioned in said first beam path.

17. *(original)* The system of claim 16, further comprising a second toroidal mirror, said first toroidal mirror being positioned to collimate said probe beam to produce a collimated probe beam, said second toroidal mirror being positioned to focus said collimated probe beam.

18. *(original)* The system of claim 8, further comprising a third toroidal mirror positioned in said second beam path.

19. *(original)* The system of claim 18, further comprising a fourth toroidal mirror, said third toroidal mirror being positioned to collimate said response beam to produce a collimated response beam, said fourth toroidal mirror being positioned to focus said collimated response beam.

20. *(original)* The system of claim 19, further comprising a first toroidal mirror positioned to collimate said probe beam to produce a collimated probe beam, and a second toroidal mirror being positioned to focus said collimated probe beam, said collimated probe beam crossing said collimated response beam at said beam crossing.

21. *(original)* The system of claim 20, wherein a first optical length from said first toroidal mirror to said second toroidal mirror equals a second optical length from said first toroidal mirror to said fourth toroidal mirror passing through said

beam crossing.

22. *(original)* The system of claim 8, further comprising at least one lensing element positioned in said first beam path.

23. *(original)* The system of claim 8, further comprising at least one lensing element positioned in said second beam path.

24. *(original)* The system of claim 8, further comprising at least one optical fiber in said first beam path.

25. *(original)* The system of claim 8, further comprising at least one optical fiber in said second beam path.